N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

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Research Design

Contributors
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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental
Concepts Relevant to Research Design (1)

**Causality**

A \[\rightarrow\] B
Pressure \[\rightarrow\] Ulcer

**Multicausality**

Years smoking \[\rightarrow\] Heart disease
High fat diet \[\rightarrow\] Heart disease
Limited exercise \[\rightarrow\] Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study
- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- **Controlling extraneous variables**
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

No

Yes

Is the primary purpose examination of relationships?

No

Yes

Is the treatment tightly controlled by the researcher?

No

Yes

Descriptive Design

Will the sample be studied as a single group?

No

Yes

Quasi-Experimental Study

Will a randomly assigned control group be used?

No

Yes

Correlational Design

Is the original sample randomly selected?

No

Yes

Experimental Study
Selecting a Descriptive Design

Examining sequences across time?
- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Data collected across time
- Yes
  - Following same subjects across time?
    - No
      - Cross-sectional design
    - Yes
      - Studying events partitioned across time?
        - No
          - Trend Analysis
        - Yes
          - Repeated measures of each subject
- Yes
  - Single unit of study
    - No
      - Longitudinal Study
    - Yes
      - Case Study

Research Design
Cross-sectional design with treatment partitioning
Longitudinal design with treatment partitioning
A Typical Descriptive Design

**Clarification** ➔ **Measurement** ➔ **Description** ➔ **Interpretation**

**Phenomenon of Interest**
- **Variable 1**
- **Variable 2**
- **Variable 3**
- **Variable 4**

**Description of Variable**
- Description of Variable 1
- Description of Variable 2
- Description of Variable 3
- Description of Variable 4

**Interpretation of Meaning**

**Development of Hypotheses**
A Comparative Descriptive Design

Group I
{variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Group II
{variables measured}

Describe

Development of Hypotheses
Selecting the Type of Correlational Design

<table>
<thead>
<tr>
<th>Describe relationships between/among variables?</th>
<th>Predict relationships between/among variables?</th>
<th>Test theoretically proposed Relationships?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive correlational design</td>
<td>Predictive correlational design</td>
<td>Model testing design</td>
</tr>
</tbody>
</table>
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses

Description of variable

Research Variable 2
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

- Control Group?
  - No
    - Pretest?
      - No
        - One-group post-test only design
      - Yes
        - Repeated Measures?
          - No
            - Strategy for Comparison
              - No
                - Suggest Reevaluating design
                - One group pretest/post-test design
            - Yes
              - Compare treatment & control conditions?
  - Yes
    - Pretest?
      - No
        - Comparison with population values?
      - Yes
        - Repeated Measures?
          - No
            - Yes
              - Yes
Selecting The Type of Experimental Design

Pretest
  No
  Post-test only control group design
  Yes
  Repeated Measurements?
    No
    Examine effects of confounding variables?
      No
      Multiple sites?
      Pretest/post-test control group design
      Yes
      Randomized clinical trials
    Yes
    Blocking?
      No
      Comparison of multiple levels of treatment
      Pretest/post-test control group design
      Yes
      Randomized Block Design
      Yes
      Examination of complex relationships among variables in relation to treatment
      Nested Designs
### Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Treatment:</th>
<th>Under control of researcher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findings:</td>
<td>Comparison of pretest and post-test scores</td>
</tr>
<tr>
<td></td>
<td>Comparison of experimental and control groups</td>
</tr>
<tr>
<td></td>
<td>Comparison of pretest-post-test differences between samples</td>
</tr>
<tr>
<td>Uncontrolled threats to validity:</td>
<td>Testing, Mortality</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>Restricted generalizability as control increases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>PRETEST</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td></td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
</table>

**Research Design**
### Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td>POST-TEST</td>
<td>POST-TEST</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:**
- Instrumentation
- Mortality
- Limited generalizability as control increases
### Nested Design

**Pain Control Management**

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRN Medication</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New approach: “Around the clock” medication</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Primary Nursing Care**

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
</tr>
<tr>
<td>Unit E</td>
<td>Unit F</td>
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<tr>
<td>Unit G</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

**Research Design**
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

• Identify the design
  ○ Name it specifically

• Provide a map of the design
• Discuss your rationale for using this design
• Describe threats to the validity of the chosen design